THE AMERICAN TECHNOLOGY INITIATIVE

for

AEROSPACE RESEARCH, TECHNOLOGY TRANSFER,
AND COMMERCIALIZATION

JOINT SPONSORED RESEARCH AGREEMENT

8901-GA

Government Addition

(NASA-AMTECH-VPI)

ACSYNT Software for The Conceptual Design of Aircraft

1991

JOINT SPONSORED RESEARCH AGREEMENT
8901-GA

SECTION 1

PREAMBLE

1.1 Whereas NASA developed over a twenty year period the ACSYNT software, a unique and valuable program for designing aircraft in the preliminary stages;

1.2 Whereas, due to VPI's outstanding capability in computer aided design and mechanical engineering, NASA funded VPI under a Cooperative Agreement (NAG-2-461) since 1986 to develop and enhance the ACSYNT software;

1.3 Whereas NASA recognized the interest of U.S. aerospace companies in using the ACSYNT software and supporting its further enhancement;

1.4 Whereas in 1989 AmTech secured interest by NASA, VPI and four aerospace companies (Northrop, Lockheed, Boeing Helicopters, and General Electric Aircraft Engines) to form a structure, called **The ACSYNT Institute**, whereby interested U.S. companies could work collaboratively with NASA and VPI on the ACSYNT software and share the research costs and results;

1.5 Whereas in 1990 AmTech and VPI offered to U.S. aerospace companies and educational institutions an agreement (called **JSRA 8901)** in the style of a **Joint Sponsored Research Agreement**; to date, signatories to **JSRA 8901** and sponsors of **The ACSYNT Institute** are: Northrop, Lockheed, Boeing Helicopters, Boeing Commercial Airplane Group, General Electric Aircraft Engines, Mc Donnell Douglas, Cessna, the Naval Postgraduate School, and the USAF Academy;

1.6 Whereas NASA is a sponsor of **The ACSYNT Institute** through its Cooperative Agreement with VPI (NAG-2-461);

1.7 Whereas NASA-Àmes and the other sponsors of **The ACSYNT Institute** desire that NASA convert its participation from a Cooperative Agreement to a Space Act agreement, titled **"Joint Sponsored Research Agreement 8901-GA"** in order that NASA can: (i) directly influence the overall R&D carried out under both NASA and private sector funds, (ii) request and receive rights to the Integrated ACSYNT software, and (iii) reduce NASA funds spent on university overhead (30% less overhead for Space Act agreement than for grant);

THEREFORE, this **JOINT SPONSORED RESEARCH AGREEMENT 8901-GA** converts NASA's participation in **The ACSYNT Institute** from the Cooperative Agreement NAG-2-461 to a funded Space Act agreement, under the terms setforth herein.

SECTION 2

DEFINITIONS

2.0 The following definitions apply throughout this Agreement:

2.01 ***GOVERNMENT ADDITION JSRA 8901*** (JSRA 8901-GA) means this Agreement between AmTech, NASA, and VPI.

2.02 ***JOINT SPONSORED RESEARCH AGREEMENT 8901*** (JSRA 8901) means the agreement between AmTech, VPI, and U.S. companies and educational institutions, which became effective on January 2, 1990.

2.03 ***NASA*** means the National Aeronautics and Space Administration, acting through the NASA-Ames Research Center, located at Moffett Field, CA 94035.

2.04 ***VPI*** means Virginia Polytechnic Institute and State University, an educational institution, located in Blacksburg, VA 24061.

2.05 ***AMTECH*** means American Technology Initiative, a California nonprofit corporation located at 545 Middlefield Road, Suite 170, Menlo Park, CA 94025.

2.06 ***VTIP*** means Virginia Tech Intellectual Properties, Inc., a licensing organization for intellectual property owned by VPI, located at Virginia Tech Corporate Research Center, 1900 Kraft Drive, Blacksburg, VA 24060.

2.07 ***ACYSNT*** means aircraft-synthesis, and is the name given to the software program originally developed by NASA and being furthered developed under this Agreement and the Joint Sponsored Research Agreement 8901. The software integrates aircraft requirements and conceptual design tools in a transportable, interactive, three-dimensional advanced graphic package.

2.08 ***ACSYNT INSTITUTE*** means the collective activities of AMTECH, VPI and PARTICIPANTS, and NASA under the terms of the Joint Sponsored Research Agreement 8901.

2.09 ***SPONSOR*** means a U.S. company or academic institution subscribing to the Joint Sponsored Research Agreement 8901, and NASA, providing support to The ACSYNT Institute under the Cooperative Agreement NAG-2-461 or this Space Act agreement.

2.10 ***PARTICIPANT*** means a company or educational institution which subscribes to the Joint Sponsored Research Agreement 8901 (and the accompanying License Agreement).

2.11 ***VPI-Derived ACSYNT*** means ACSYNT code and documentation written by VPI, or expressly for VPI, by agents, contractors, students, or consultants, either prior to this Agreement or in performance of this Agreement. VPI-Derived ACSYNT does not include any VPI-Acquired ACSYNT.

2.12 ***NASA-Derived ACSYNT*** means ACSYNT code and documentation written by NASA employees or on-site support service contractors prior to this Agreement and during the performance of this Agreement.

2.13 ***VPI-Acquired ACSYNT*** means ACSYNT feedback data received by VPI from participants of the ACSYNT Institute.

2.14 ***Integrated ACSYNT*** means the summation of VPI-Derived ACSYNT, NASA-Derived ACSYNT, and VPI-Acquired ACSYNT.

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3.0 The legal authority for NASA to enter into this Agreement is found in Section 203(c)(5) and (6) of the Space Act of 1958 (42 U.S.C. s2451 *et seq.*).

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4.0 The parties to this Agreement are:

(i) NASA; (ii) VPI; and (iii) AmTech.

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5.0 This Agreement has four principal purposes:

(i) to document NASA's sponsorship of The ACSYNT Institute and its collaboration with VPI and Participants in a joint effort to develop the ACSYNT software;

(ii) to advance NASA's misson oriented R&D in aeronautical sciences and technologies through support of the work set forth in Section 8, herein;

(iii) to create R&D efficiencies by combining resources and know-how in order to accomplish the R&D objectives and meet the technology needs of government, industry, and academia; and

(iv) to enhance U.S. competitiveness by facilitating the transfer of the ACSYNT software to industry and educational institutions through the ACSYNT Institute, and by supporting the commercialization of the ACSYNT software.

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6.0 This Agreement commences when each party hereto signs the Agreement.

6.1 This Agreement will be effective through December 31, 1994.

6.2 This Agreement may be extended by the written agreement of all signatory parties; extension of this Agreement shall be predicated on the extension of the related agreement, **JSRA 8901.**

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ACSYNT INSTITUTE MANAGEMENT

7.0 RESEARCH MANAGEMENT

(i) VPI and NASA shall co-manage the research and development work set forth in Section 8, herein. VPI and NASA shall jointly determine the R&D plan and annual list of deliverables, after conferring with the industry and university participants in the annual meeting of ACSYNT Institute participants. The annual R&D plan and list of deliverables shall reflect, to the extent possible, the research objectives and technology needs of NASA and VPI and the parties to the related agreement, **JSRA 8901;**

(ii) VPI and NASA shall co-manage the annual meeting of ACSYNT Institute participants, to provide a forum for discussion on the progress of the ACSYNT software, and determine the future direction of research and development.

7.1 EXPANDING SPONSORSHIP

VPI, NASA, and AmTech shall jointly manage the effort to expand sponsorship of the ACSYNT Institute. Responsibilities shall be divided as follows:

(i) Technical presentations to prospective participants will be the joint responsibility of VPI and NASA;

(ii) NASA-Ames will be responsible for making appropriate arrangements with other NASA Centers and other government agencies for their participation in the ACSYNT Institute. NASA-Ames will promptly notify AmTech and VPI of any arrangements made, and the amount of funds committed;

(iii) AmTech shall be responsible for managing the sponsorship of participants in the ACSYNT Institute, including administrative processing of new participants and other responsibilities setforth in the Joint Sponsored Research Agreement 8901.

7.2 TRAINING SESSIONS

VPI shall manage training sessions or assistance programs for ACSYNT Institute sponsors. VPI shall inform NASA and AmTech of any requests from sponsors for training, and of any plans by VPI to provide training. NASA shall provide and/or participate in training sessions in its discretion.

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RESEARCH GOALS AND OBJECTIVES

8.0 SCOPE OF JOINT WORK

(i) Overall Goals and Objectives

The objectives of the ACSYNT Institute are:

(1) to perform fundamental research into the methods by which conceptual and preliminary design of aircraft can be improved, considering quality, productivity and cost;

(2) to create a mathematical, empirical and algorithmic solution to achieve (1) above;

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(8) to foster commercialization of ACSYNT.

(ii) The Joint R&D Plan

(1) The joint R&D plan through 1994 is annexed in the Appendix;

(2) The joint R&D plans for 1990 and 1991 respectively are annexed in the Appendix.

8.1 DELIVERABLES

(i) The list of 1991 intellectual property rights deliverables is annexed in the Appendix.

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RESPONSIBILITY FOR RESEARCH TASKS & DELIVERABLES

9.0 VPI RESPONSIBILITY

VPI will perform all funded research, development and support of ACSYNT. All releases of the code and documentation will be performed by VPI. VPI will cooperate with NASA in the generation of detailed R&D plans and list of deliverables.

9.1 NASA RESPONSIBILITY

NASA will provide in-house support of ACSYNT methodology enhancements, consistent with NASA goals. NASA will provide expert input to the research performed by VPI, and will act as the technical mediator to assist with the prioritization of research requests from Participants. NASA will cooperate in testing of improvements and new releases, and will assist in the incorporation of enhancements made by NASA to the code generated by VPI. NASA will assist in the generation of detailed R&D plans.

9.2 NASA and VPI shall make all reasonable efforts to achieve the research and development results set forth herein.

SECTION 10

FUNDING COMMITMENTS

10.0 ACSYNT INSTITUTE R&D BUDGET

(i) VPI shall be responsible for submitting to NASA and AmTech an annual R&D budget for the ACSYNT Institute. The budget shall be submitted no later than December 1 for each approaching calendar year;

(ii) The 1991 budget for the ACSYNT Institute is annexed in the Appendix.

10.1 VPI COMMITMENT

(i) VPI shall commit any and all funds obtained from AmTech (derived from industry and academic participants) under the **JSRA 8901** to the support of work set forth in Section 8, herein.

(ii) VPI shall commit any and all funds obtained from The Center for Innovative Technology, a nonprofit organization created by the State of Virginia to support efforts leading to business development in Virginia, for sponsorship of the ACSYNT Institute or for the commercialization of the ACSYNT software;

(iii) VPI shall charge an overhead rate of sixteen (16) percent on funds it receives from AmTech under this Agreement and the related agreement, **JSRA 8901.**

10.2 NASA COMMITMENT

(i) NASA, acting through the NASA-Ames Research Center, intends to commit funds in the amount of $100,000 per year for support of R&D to be carried out by VPI;

(ii) NASA-Ames will collect from and add to the NASA-Ames funding commitment those funds received from other NASA Centers or other government agencies for support of R&D to be carried out by VPI.

10.3 LIMITATION ON GOVERNMENT OBLIGATION

NASA's performance of this Agreement is subject to the availability of NASA's appropriations and nothing in this Agreement commits the United States Congress to appropriate funds therefor.

10.4 FUNDS MANAGEMENT

(i) NASA-Ames shall make payment to AmTech of its full annual funding commitment within sixty (60) days of receipt of invoice from AmTech;

(ii) The NASA-Ames principal investigator shall be responsible for managing the timely payment of NASA funds to AmTech;

(iii) When NASA-Ames receives funds from other NASA Centers or other government agencies, NASA shall promptly notify AmTech of the availability of funds, and shall pay such funds to AmTech within sixty (60) days of receipt of invoice from AmTech;

(iv) AmTech shall maintain funds obtained from NASA in a trust account (and funds obtained from industry and academic participants under the **JSRA 8901** in a separate trust account);

(v) AmTech shall return to NASA interest earned on funds received from NASA annually, less $100.00, or as statute permits. Interest earned on funds received from industry and academic Participants shall be provided to VPI for the support of work stated in Section 8 herein.

(vi) VPI shall quarterly invoice AmTech for R&D work. The invoices shall be consistent with and keyed to line items in the annual R&D budget;

(vii) AmTech shall pay VPI against approved invoices within fourteen (14) days of receipt.

10.5 AMTECH LIMITATION OF RESPONSIBILITY FOR FUNDS

(i) AmTech shall not be obligated to pay to VPI any funds it has not collected from NASA under this Agreement or from industry and academic participants under the **JSRA 8901;**

(ii) AmTech shall regularly notify VPI of the status of funds, and immediately notify VPI if and when AmTech learns that committed funds are not collectable.

SECTION 11

IN-KIND RESOURCE COMMITMENTS

11.0 NASA COMMITMENTS

(i) Twenty-five percent (25%) FTE of (1) Paul Gelhausen, Aerospace Engineer; and (2) Mark Moore, Aerospace Engineer;

(ii) Staff time as required to provide hardware and software support in the mutual interests of NASA and the ACSYNT Institute.

11.1 VPI COMMITMENTS

(i) Up to fifty percent (50%) FTE of (1) Dr. Arvid Myklebust; and if available, (2) Dr. Sankar Jayaram;

(ii) Use of the Computer Aided Design Laboratory facilities at VPI;

(iii) Use of a Silicon Graphics Iris 4D/80 GT;

(iv) VPI shall reduce its standard overhead charge of fifty-three percent (53%) to sixteen percent (16%) on funds it receives from AmTech under this Agreement and the related agreement, **JSRA 8901.**

SECTION 12

AMTECH FACILITATION SUPPORT COST

12.0 AmTech will receive a facilitation support cost of ten percent (10%) on R&D funds committed by NASA under this Agreement for facilitation of this Joint Sponsored Research project throughout its duration.

SECTION 13

INTELLECTUAL PROPERTY

13.0 RIGHT TO COPYRIGHT

Nothing in this Agreement prevents VPI from claiming copyright in VPI-Derived ACSYNT.

13.1 RIGHTS IN NASA-DERIVED ACSYNT

The development of NASA-Derived ACSYNT began in the 1970's and it was initially written by NASA employees. Subsequently, the employees were aided by on-site support-service contractors. The portion of NASA-Derived ACSYNT attributable to NASA employees is not copyrightable in the United States because of 17 U.S.C. 105. The Government minimally has unlimited rights to the portion of NASA-Derived ACSYNT prepared by NASA on-site support-service contractors. NASA-Derived ACSYNT is presently being expanded and/or modified by NASA employees and on-site support-service contractor Sterling Federal System, Inc. (contract NAS2-13210). Since the initiation of development of NASA-Derived ACSYNT, NASA has granted some non-exclusive licenses (hereinafter called Existing Licenses) for NASA-Derived ACSYNT.

13.2 QUIT CLAIM

NASA hereby assigns, transfers, and quit claims to VPI all NASA's right, title, and interest in NASA-Derived ACSYNT subject to the Existing Licenses and subject to an irrevocable, paid-up, nonexclusive license (hereinafter Government License), in perpetuity, for the Government to use, reproduce, and prepare derivative works of NASA-Derived ACSYNT and for the Government to disclose NASA-Derived ACSYNT to third parties, when it is required for use on a Government contract, grant, agreement or understanding, domestic or foreign (hereinafter called Disclosure Circumstances). When a disclosure is made by the Government pursuant to the Disclosure Circumstances, a recipient shall be precluded from disseminating NASA-Derived ACSYNT to third parties and may only use NASA-Derived ACSYNT for the period of the pertinent contract, grant, agreement or understanding. More

specifically, as to NASA Contract NAS2-13210, and that contract alone, NASA shall direct the contractor, pursuant to the FAR 52.227-17 clause in the contract, to assign the copyright for NASA-Derived ACSYNT (produced under the contract) to VPI subject to the Existing Licenses and the Government License.

13.3 INTEGRATED ACSYNT

For the term of this Agreement, VPI has the duty of delivering Integrated ACSYNT to NASA as it is generated. VPI grants, and warrants that it has the right to grant, the Government the Government License for all VPI-Derived ACSYNT and all VPI-Acquired ACSYNT delivered to NASA. When disclosure of Integrated ACSYNT is made by the Government pursuant to the Disclosure Circumstances, the recipient shall be precluded from disclosing the Integrated ACSYNT to third parties and recipients may only use the Integrated ACSYNT for the period of the pertinent contract, grant, agreement or understanding. NASA may disclose the Integrated ACSYNT to all ACSYNT participants, sponsors and Government contributors.

13.4 INVENTIONS

This Agreement is a "funding agreement" as defined in 35 U.S.C. 200 *et seq.* If any VPI-Derived ACSYNT produced under the Agreement is a "subject invention" then 35 U.S.C. 200 *et seq.* and the implementing regulations shall define the rights of the parties to each subject invention; however, NASA agrees that the maximum rights NASA will exercise for any subject invention is the Government License.

13.5 AMTECH RIGHTS

Nothing herein provides AmTech a license to Integrated ACSYNT or any part thereof. Neither NASA nor VPI objects to AmTech inspection of Integrated ACSYNT while it is in the control and possession of VPI or NASA.

SECTION 14

KEY PERSONNEL

14.0 The following personnel are designated as key officials for their respective party. These key officials are the principal point of contact between the parties in the performance of this JSRA Phase 1 are:

VPI
Dr. Arvid Myklebust
Principal Investigator
Department of Mechanical Engineering
VPI
Blacksburg, VA 24061-0238
Tel (703) 231-7195

NASA
Mr. Paul Gelhausen
Principal Investigator
NASA-Ames Research Center
Mail Stop 237-3
Moffett Field, CA 94035
Tel (415) 604-5701

SECTION 15

TERMINATION

15.0 A party may terminate this Agreement upon six months written notice to the other parties signatory.

15.1 In the event NASA terminates this Agreement and provides less than six months notice of termination, it may be liable to VPI for the following costs:

(i) accounting, clerical, and other expenses reasonably necessary for the preparation of termination settlement proposals and supporting records;

(ii) salaries for professors and graduate students to which VPI is committed under this Agreement until the next normal hiring period.

15.2 Notwithstanding Sections 15.0-15.1 above, NASA or VPI may terminate this Agreement upon ninety (90) days notice in writing if a key person, as designated in Section 14, should become unavailable through no act of VPI or NASA, and if no suitable replacement can be timely substituted.

15.3 If this Agreement is terminated, AmTech will promptly return to NASA any funds in its possession provided by NASA for support of work under this Agreement, less any amounts required to cover authorized expenses accrued by VPI up to the date of termination (including any costs due VPI under 15.1, above).

SECTON 16

DISPUTES

16.0 All disputes concerning questions of fact or law arising under this Agreement shall be referred by the claimant in writing to the NASA Ames Research Center for resolution. The parties cited above shall seek to resolve any dispute by mutual agreement which shall be final and conclusive.

16.1 If the parties cited in paragraph 16.0 are unable to agree on a resolution, the claimant may submit the dispute in writing to the NASA Associate Administrator, Office of Aeronautics, Exploration and Technology, who shall attempt to resolve the dispute by mutual agreement among the parties which shall be final and conclusive.

16.2 Any dispute which is not resolved by mutual agreement of the NASA Associate Administrator for OAET and the other parties to this agreement, within 60 days of both parties receiving written notice of the dispute, may be submitted in writing by the claimant to the NASA Administrator. At his discretion, the NASA Administrator may choose to delegate this decisional authority. In connection with any proceeding before the Administrator, or his authorized respresentative, under this paragraph 16.2, the claimant shall be offered an opportunity to be heard and to offer evidence in support of its complaint. The decision of the Administrator, or his

SECTION 18

GENERAL PROVISIONS

18.0 No party to this Agreement may assign, transfer or otherwise convey any or all of its rights or obligations hereunder without the prior written consent of the other parties.

18.01 No amendment of this Agreement shall be effective unless it is in writing and executed by the parties hereto.

18.02 Each party to this Agreement will exercise all reasonable efforts in the performance of its responsibilities hereunder

18.03 No member or delegate to the United States Congress, or resident commissioner will be admitted to any share or part of this Agreement or to any benefit that may arise therefrom, but this provision will not be construed to extend to this Agreement if made with a corporation for its general benefit.

SECTION 19

EXECUTION

NASA:

By: _____

Name: Arnold D. Aldrich

Title: Associate Administrator for Aeronautics, Exploration and Technology

Date: 10-22-91

Virginia Polytechnic Institute and State University:

By: _____

Name: H. T. Hurd

Title: Director of Sponsored Programs

Date: 8/30/91

American Technology Initiative:

By: _____

Name: DAVID B. LLOYD

Title: CHIEF ADMIN. OFFICER

Date: 9/3/91

APPENDIX

(i) Four year R&D Plan (1990-1994)

(ii) Detailed 1990 R&D Plan

(iii) Detailed 1991 R&D Plan

(iv) 1990 and 1991 Deliverables

(v) 1991 R&D Budget

JOINT SPONSORED RESEARCH AGREEMENT
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SECTION 1

PREAMBLE

1.1 Whereas NASA developed over a twenty year period the ACSYNT software, a unique and valuable program for designing aircraft in the preliminary stages;

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9.1 NASA RESPONSIBILITY

NASA will provide in-house support of ACSYNT methodology enhancements, consistent with NASA goals. NASA will provide expert input to the research performed by VPI, and will act as the technical mediator to assist with the prioritization of research requests from Participants. NASA will cooperate in testing of improvements and new releases, and will assist in the incorporation of enhancements made by NASA to the code generated by VPI. NASA will assist in the generation of detailed R&D plans.

9.2 NASA and VPI shall make all reasonable efforts to achieve the research and development results set forth herein.

SECTION 10

FUNDING COMMITMENTS

10.0 ACSYNT INSTITUTE R&D BUDGET

(i) VPI shall be responsible for submitting to NASA and AmTech an annual R&D budget for the ACSYNT Institute. The budget shall be submitted no later than December 1 for each approaching calendar year;

(ii) The 1991 budget for the ACSYNT Institute is annexed in the Appendix.

10.1 VPI COMMITMENT

(i) VPI shall commit any and all funds obtained from AmTech (derived from industry and academic participants) under the **JSRA 8901** to the support of work set forth in Section 8, herein.

(ii) VPI shall commit any and all funds obtained from The Center for Innovative Technology, a nonprofit organization created by the State of Virginia to support efforts leading to business development in Virginia, for sponsorship of the ACSYNT Institute or for the commercialization of the ACSYNT software;

(iii) VPI shall charge an overhead rate of sixteen (16) percent on funds it receives from AmTech under this Agreement and the related agreement, **JSRA 8901**.

10.2 NASA COMMITMENT

(i) NASA, acting through the NASA-Ames Research Center, intends to commit funds in the amount of $100,000 per year for support of R&D to be carried out by VPI;

(ii) NASA-Ames will collect from and add to the NASA-Ames funding commitment those funds received from other NASA Centers or other government agencies for support of R&D to be carried out by VPI.

10.3 LIMITATION ON GOVERNMENT OBLIGATION

NASA's performance of this Agreement is subject to the availability of NASA's appropriations and nothing in this Agreement commits the United States Congress to appropriate funds therefor.

10.4 FUNDS MANAGEMENT

(i) NASA-Ames shall make payment to AmTech of its full annual funding commitment within sixty (60) days of receipt of invoice from AmTech;

(ii) The NASA-Ames principal investigator shall be responsible for managing the timely payment of NASA funds to AmTech;

(iii) When NASA-Ames receives funds from other NASA Centers or other government agencies, NASA shall promptly notify AmTech of the availability of funds, and shall pay such funds to AmTech within sixty (60) days of receipt of invoice from AmTech;

(iv) AmTech shall maintain funds obtained from NASA in a trust account (and funds obtained from industry and academic participants under the **JSRA 8901** in a separate trust account);

(v) AmTech shall return to NASA interest earned on funds received from NASA annually, less $100.00, or as statute permits. Interest earned on funds received from industry and academic Participants shall be provided to VPI for the support of work stated in Section 8 herein.

(vi) VPI shall quarterly invoice AmTech for R&D work. The invoices shall be consistent with and keyed to line items in the annual R&D budget;

(vii) AmTech shall pay VPI against approved invoices within fourteen (14) days of receipt.

10.5 AMTECH LIMITATION OF RESPONSIBILITY FOR FUNDS

(i) AmTech shall not be obligated to pay to VPI any funds it has not collected from NASA under this Agreement or from industry and academic participants under the **JSRA 8901;**

(ii) AmTech shall regularly notify VPI of the status of funds, and immediately notify VPI if and when AmTech learns that committed funds are not collectable.

SECTION 11

IN-KIND RESOURCE COMMITMENTS

11.0 NASA COMMITMENTS

(i) Twenty-five percent (25%) FTE of (1) Paul Gelhausen, Aerospace Engineer; and (2) Mark Moore, Aerospace Engineer;

(ii) Staff time as required to provide hardware and software support in the mutual interests of NASA and the ACSYNT Institute.

11.1 VPI COMMITMENTS

(i) Up to fifty percent (50%) FTE of (1) Dr. Arvid Myklebust; and if available, (2) Dr. Sankar Jayaram;

(ii) Use of the Computer Aided Design Laboratory facilities at VPI;

(iii) Use of a Silicon Graphics Iris 4D/80 GT;

(iv) VPI shall reduce its standard overhead charge of fifty-three percent (53%) to sixteen percent (16%) on funds it receives from AmTech under this Agreement and the related agreement, **JSRA 8901.**

SECTION 12

AMTECH FACILITATION SUPPORT COST

12.0 AmTech will receive a facilitation support cost of ten percent (10%) on R&D funds committed by NASA under this Agreement for facilitation of this Joint Sponsored Research project throughout its duration.

SECTION 13

INTELLECTUAL PROPERTY

13.0 RIGHT TO COPYRIGHT

Nothing in this Agreement prevents VPI from claiming copyright in VPI-Derived ACSYNT.

13.1 RIGHTS IN NASA-DERIVED ACSYNT

The development of NASA-Derived ACSYNT began in the 1970's and it was initially written by NASA employees. Subsequently, the employees were aided by on-site support-service contractors. The portion of NASA-Derived ACSYNT attributable to NASA employees is not copyrightable in the United States because of 17 U.S.C. 105. The Government minimally has unlimited rights to the portion of NASA-Derived ACSYNT prepared by NASA on-site support-service contractors. NASA-Derived ACSYNT is presently being expanded and/or modified by NASA employees and on-site support-service contractor Sterling Federal System, Inc. (contract NAS2-13210). Since the initiation of development of NASA-Derived ACSYNT, NASA has granted some non-exclusive licenses (hereinafter called Existing Licenses) for NASA-Derived ACSYNT.

13.2 QUIT CLAIM

NASA hereby assigns, transfers, and quit claims to VPI all NASA's right, title, and interest in NASA-Derived ACSYNT subject to the Existing Licenses and subject to an irrevocable, paid-up, nonexclusive license (hereinafter Government License), in perpetuity, for the Government to use, reproduce, and prepare derivative works of NASA-Derived ACSYNT and for the Government to disclose NASA-Derived ACSYNT to third parties, when it is required for use on a Government contract, grant, agreement or understanding, domestic or foreign (hereinafter called Disclosure Circumstances). When a disclosure is made by the Government pursuant to the Disclosure Circumstances, a recipient shall be precluded from disseminating NASA-Derived ACSYNT to third parties and may only use NASA-Derived ACSYNT for the period of the pertinent contract, grant, agreement or understanding. More

specifically, as to NASA Contract NAS2-13210, and that contract alone, NASA shall direct the contractor, pursuant to the FAR 52.227-17 clause in the contract, to assign the copyright for NASA-Derived ACSYNT (produced under the contract) to VPI subject to the Existing Licenses and the Government License.

13.3 INTEGRATED ACSYNT

For the term of this Agreement, VPI has the duty of delivering Integrated ACSYNT to NASA as it is generated. VPI grants, and warrants that it has the right to grant, the Government the Government License for all VPI-Derived ACSYNT and all VPI-Acquired ACSYNT delivered to NASA. When disclosure of Integrated ACSYNT is made by the Government pursuant to the Disclosure Circumstances, the recipient shall be precluded from disclosing the Integrated ACSYNT to third parties and recipients may only use the Integrated ACSYNT for the period of the pertinent contract, grant, agreement or understanding. NASA may disclose the Integrated ACSYNT to all ACSYNT participants, sponsors and Government contributors.

13.4 INVENTIONS

This Agreement is a "funding agreement" as defined in 35 U.S.C. 200 *et seq.* If any VPI-Derived ACSYNT produced under the Agreement is a "subject invention" then 35 U.S.C. 200 *et seq.* and the implementing regulations shall define the rights of the parties to each subject invention; however, NASA agrees that the maximum rights NASA will exercise for any subject invention is the Government License.

13.5 AMTECH RIGHTS

Nothing herein provides AmTech a license to Integrated ACSYNT or any part thereof. Neither NASA nor VPI objects to AmTech inspection of Integrated ACSYNT while it is in the control and possession of VPI or NASA.

SECTION 14

KEY PERSONNEL

14.0 The following personnel are designated as key officials for their respective party. These key officials are the principal point of contact between the parties in the performance of this JSRA Phase 1 are:

VPI
Dr. Arvid Myklebust
Principal Investigator
Department of Mechanical Engineering
VPI
Blacksburg, VA 24061-0238
Tel (703) 231-7195

NASA
Mr. Paul Gelhausen
Principal Investigator
NASA-Ames Research Center
Mail Stop 237-3
Moffett Field, CA 94035
Tel (415) 604-5701

SECTION 15

TERMINATION

15.0 A party may terminate this Agreement upon six months written notice to the other parties signatory.

15.1 In the event NASA terminates this Agreement and provides less than six months notice of termination, it may be liable to VPI for the following costs:

(i) accounting, clerical, and other expenses reasonably necessary for the preparation of termination settlement proposals and supporting records;

(ii) salaries for professors and graduate students to which VPI is committed under this Agreement until the next normal hiring period.

15.2 Notwithstanding Sections 15.0-15.1 above, NASA or VPI may terminate this Agreement upon ninety (90) days notice in writing if a key person, as designated in Section 14, should become unavailable through no act of VPI or NASA, and if no suitable replacement can be timely substituted.

15.3 If this Agreement is terminated, AmTech will promptly return to NASA any funds in its possession provided by NASA for support of work under this Agreement, less any amounts required to cover authorized expenses accrued by VPI up to the date of termination (including any costs due VPI under 15.1, above).

SECTON 16

DISPUTES

16.0 All disputes concerning questions of fact or law arising under this Agreement shall be referred by the claimant in writing to the NASA Ames Research Center for resolution. The parties cited above shall seek to resolve any dispute by mutual agreement which shall be final and conclusive.

16.1 If the parties cited in paragraph 16.0 are unable to agree on a resolution, the claimant may submit the dispute in writing to the NASA Associate Administrator, Office of Aeronautics, Exploration and Technology, who shall attempt to resolve the dispute by mutual agreement among the parties which shall be final and conclusive.

16.2 Any dispute which is not resolved by mutual agreement of the NASA Associate Administrator for OAET and the other parties to this agreement, within 60 days of both parties receiving written notice of the dispute, may be submitted in writing by the claimant to the NASA Administrator. At his discretion, the NASA Administrator may choose to delegate this decisional authority. In connection with any proceeding before the Administrator, or his authorized respresentative, under this paragraph 16.2, the claimant shall be offered an opportunity to be heard and to offer evidence in support of its complaint. The decision of the Administrator, or his

duly authorized representative, in the determination of such disputes shall be deemed to be a final agency decision. Upon receipt of such final decision, the claimant shall be free to pursue any remedy which may be available to it in any other court or forum as may be prescribed by law.

16.3 Pending resolution of any disputes pursuant to this SECTION 16, the parties agree that performance of all obligations shall be pursued diligently in accordance with the direction of the NASA signatory.

16.4 The parties agree that this DISPUTES proceedure shall be the exclusive procedure followed by the parties in resolving any dispute arising under, or based on, an express or implied provision of this Agreement, including an alleged breach.

SECTION 17

LIABILITY

17.0 NONPERFORMANCE

Each party signatory hereto is responsible for its own performance as required by this Agreement. No party, if not a cause of or contributor to fault, shall be held liable for the nonperformance of another party.

17.1 PRODUCTS LIABILITY

VPI shall include in any arrangement it makes with Virginia Tech Intellectual Properties, Inc. (VTIP) or another party to license the ACSYNT software a provision requiring the licensee to hold AmTech and NASA harmless from and indemnify them against claims of product liability arising from licensee's use of ACSYNT.

SECTION 18

GENERAL PROVISIONS

18.0 No party to this Agreement may assign, transfer or otherwise convey any or all of its rights or obligations hereunder without the prior written consent of the other parties.

18.01 No amendment of this Agreement shall be effective unless it is in writing and executed by the parties hereto.

18.02 Each party to this Agreement will exercise all reasonable efforts in the performance of its responsibilities hereunder

18.03 No member or delegate to the United States Congress, or resident commissioner will be admitted to any share or part of this Agreement or to any benefit that may arise therefrom, but this provision will not be construed to extend to this Agreement if made with a corporation for its general benefit.

SECTION 19

EXECUTION

NASA:

By: _____

Name: Arnold D. Aldrich

Title: Associate Administrator for
Aeronautics, Exploration and Technology

Date: 10-22-91

Virginia Polytechnic Institute and State University:

By: _____

Name: H. T. Hurd

Title: Director of Sponsored Programs

Date: 8/30/91

American Technology Initiative:

By: _____

Name: DAVID B. LLOYD

Title: CHIEF ADMIN. OFFICER

Date: 9/3/91

ACSYNT INSTITUTE

BUDGET 1991

SOURCE OF FUNDS

Source	Amount
NASA	$100,000
Industry	$180,000
VPI*	$117,656
TOTAL	$397,656

*includes funds provided by The Center for Innovative Technology

USES OF FUNDS

Use	Amount
Institute Director Prof. Myklebust	$40,490
Assoc. Director Prof. Jayaram	$26,780
Graduate Assistants	$111,969
Undergraduate Assistants	$7,620
Support Software	$13,000
Hardware Maintenance	$6,500
Supplies & Materials	$6,390
Travel	$14,000
Fringe Benefits on Salaries	$17,247
Indirect Cost	$125,659
AmTech Facilitation Cost	$28,000
TOTAL DIRECT COST	$243,997
TOTAL COST	$397,656

APPENDIX

(i) Four year R&D Plan (1990-1994)

(ii) Detailed 1990 R&D Plan

(iii) Detailed 1991 R&D Plan

(iv) 1990 and 1991 Deliverables

(v) 1991 R&D Budget

R&D PLAN
Research Tasks and Deliverables by Phase*

Phase 1 *(January 2 , 1990 - January 1, 1991)*

Deliverables:

(i) Major release of ACSYNT software incorporating enhancements made during course of phase 1;

(ii) One or more maintenance updates;

(iii) One Research Report, detailing research and documentation.

Research Tasks:

(1) Establish a computer aided software engineering (CASE) system to archive, maintain, update and release versions of ACSYNT.

(2) Research option of linking ACSYNT to a commercial Database Management System.

(3) Write interactive geometry interfaces to Dassault System's CATIA and CADAM Inc's CADAM. This will allow the passing of conceptual models to two of the most popular final design systems. CATIA's IUA and CADAM's IUE will be used.

(4) Research novel methods for creation of non-uniform rational B-Spline surfaces, their intersections and automatic filleting. This will allow for rapid generation of C^2 continuous aircraft geometric models. This geometry will be parallel to the existing parametric cubic surface representation. Integrate the use of non-uniform rational B-spline surfaces. Initially include limited ability to perform intersections and fillet operations.

(5) Create new techniques for automated sectioning of these aircraft models and C^2 continuous lofting using these sections. This will facilitate the generation of surface meshes for computational codes.

(6) Input mode for namelist--employ a spreed sheet method to allow the user to enter ACSYNT variables' values using the interactive graphics screens. A special window will be used for this purpose. The possibility of using pop up windows though PEX will be investigated.

(7) Feedback during execution, shading, filing I/O--instruct ACSYNT to send messages to the screen to keep the user informed of the operations being performed by the software, particularly in modules or menus in which the user has to wait a considerable time.

(8) PHIGS + Inclusion--modify ACSYNT to use PHIGS+ features for shading and transparancy. Utilize PHIGS+ (Figaro, graPHIGS++, etc.) to create shaded images of the aircraft for maximization of the capabilities of the computers/workstations.

(9) Menu Structure--modify the menu structure of ACSYNT to allow the user to use the "choice" input device (lighted button box, function keys, etc.) to select main menu items from any menu screen without having to go back to the main menu screen.

(10)* Data structure--research data bases and structures to determine the best data structure for ACSYNT. Review the requirements of a fully optimizing code required to suppport geometric modeling and graphics.

(11)* Optimization--Include in ACSYNT carpet plots and input routines for optimization.

(12) New Fuselage Shapes--include cubic cross sections of fuselage shapes in ACSYNT.

(13) Geometry of Wings--divide wings along flow lines for multiple sectioning, permitting the user to model wings similar to transport wings.

(14)* High Speed Civil Transport--allow the user to model wings (curved or crooked arrow wings)to be used in high speed civil transport aircraft.

(15)* Strakes--strakes will be modeled as wing extensionns, with the attachment of the strake to the fuselage being specified by the x-location of the strake.

(16) Inlet integration--include in ACSYNT capability of inlets analysis. Ducts (in front or back of the engine) variable number of sections and nozzles to be supported.

(17) Canopy--begin working on more realistic canopy model (e.g., cylindrical surfaces to avoid distortation of images seen by pilots etc.)

(18)* Trajectory-Integrate with trajectory, envelopemission performance, summarize output, debut level phase and trajectory output in graphical form, conceptual design reports.

(19)* Envelope Analysis--VN diagram/velocity vs. normal force

(20)* Plots of Altitute vs. Mach Number--draw plots of altitute vs. mach number for constant G or P's.

(21)* Aerodynamics--interactively execute detailed aerodynamics output and write a file for graphing.

(22) User Input for Plot Data--provide users input screen to access columns of data to be plotted in the "GRAPHS" module, superimpose the plot on ACSYNT plots.

(23)* Propulsion--integrate the code for inlet and afterbodt analysis.

(24)* Takeoff--alter takeoff input modules to match new takeoff modules.

Phase 2 (January 2, 1991- January 1, 1992)

Deliverables:

(i) Major release of ACSYNT software incorporating enhancements made during course of phase 2;

(ii) One or more maintenance updates;

(iii) One Research Report, detailing research and documentation.

Research Tasks:

(1) Implement the reorganized ACSYNT computational routines from Boeing Military Airplane utilizing NASA Ames enhancements.

(2)* Integrate Langley's wave drag analysis.

(3) Create interactive interfaces to NASA's LaWGS, PANAIR and PMARC.

(4)* Improve the interaction with and visualization of ACSYNT optimization.

(5)* Collect and distribute a test case library of existing aircraft.

(6)* Implement data structure for optimization of code.

(7)* Improve ACSYNT algorithms to include new components in models.

(8)* Airfoils: set up a preprocessor to allow the user to enter airfoil coordinates for special types of airfoils. Subsequently include twist and camber.

(9) Bombs, Stores, and Missiles--treat these as separate components in ACSYNT.

(10) Boxes--model internal boxes with names and weights for the boxes.

(11) Engine Geometry--model engine geometry in ACSYNT.

(12) Advanced Wings--begin work on supporting X , joined, and other advanced wing shapes.

(13) Advanced Aerodynamics--incorporate hooks for vortex lattice methods, etc..

(14) Weights--include the capability of graphical output for weights--e.g., bar charts, comparison bar charts, etc.

(15)* Stability--add interactive stability module to ACSYNT.

(16) Improve Geometry Definition--fully implement fillets, interactions.

(17) Create a standard Initial Graphics Exchange Specification interface (IGES). As a result conceptual design geometric models and eventually preliminary design data will be available (in batch mode) to any codes possessing an IGES interface.

Phase 3 (January 2, 1992- January 1, 1993)

Deliverables:

(i) Major release of ACSYNT software incorporating enhancements made during course of phase 3;

(ii) One or more maintenance updates;

(iii) One Research Report, detailing research and documentation.

Research Tasks:

(1) Write an expert system tutorial for ACSYNT.

(2)* Make modifications to existing modules to include turbofans, prop-fans, tilt-rotor, NASP shapes, weight equation updates, joined-wing, mission-adaptive wing and cranked-arrow wing.

(3)* Develop modules on reliabilty and Maintenance, Cost, STOVL (VSTOL).

(4)* Develop time histories for plotting takeoff.

(5) Enhance geometry definitions, shape control.

Phase 4 (January 2, 1993- January 1, 1994)

Deliverables:

(i) Major release of ACSYNT software incorporating enhancements made during course of phase 4;

(ii) One or more maintenance updates;

(iii) One Research Report, detailing research and documentation.

Research Tasks:

(1) R&D in the emerging technology of concurrent engineering. Consider maintainability and reliability at the conceptual design level.

(2) Write an interface to support the Product Data Exchange Specification (PDES) following after IGES. This will allow the status transfer of surface and solid geometry and product data to any system with a standard PDES interface.

(3) Treat interior components and engines.

(4) Include simplified equipment integration (radar, landing gear, etc.).

(5) Continue development modules on reliability and Maintenance, Cost, STOVL (VSTOL).

(6) Continue enhancement of geometry definition, shape control.

Phase 5 (January 2, 1994- January 1, 1995)

Deliverables:

(i) Major release of ACSYNT software incorporating enhancements made during course of phase 5;

(ii) One or more maintenance updates;

(iii) One Research Report, detailing research and documentation.

Research Tasks:

(1) Create a general programming interface for user applications modules.

(2) Provide for interactive return of data from preliminary design codes to ACSYNT.

(3) Write interactive interfaces for grid generation code.

(4) Create a new module for cost estimation.

(5) Create a solid modeler for ACSYNT.

***NASA's Role:**

Involvement of NASA in R&D indicated by asterisk (*). Additionally, NASA will:

(i) Review all ACSYNT enhancements;

(ii) Suggest methods of implementation regarding conceptual design techniques specifically in the areas of geometry description; interactive aerodynamics; interactive performance analysis; optimization methods; interactive takeoff analysis; installed propulsion analysis;

(iii) Upgrade technology modules in the areas of aerodynamics, propulsion, weights, and takeoff.

This R&D Plan is subject to change. Annual updates of the R&D Plan will be provided to ACSYNT Institute sponsors.

ACSYNT INSTITUTE

1990 R&D PLAN

Geometric Modeling Research and Development

*Parametric Component Generation
- -Bombs and Missiles
- -Engine
- -Canopy
- -Propellers
- -Landing Gear
- -Boxes
- -Galleys
- -Seats
- -Doors
- -Windows
- -Control surfaces

*Airfoil section generation, data entry, 5-6 digit sections
*Generalized wing (curved lines, twist and camber)
*Component library
*Cubic cross-sections/Rule based Fuselage (Lockheed input)
*Continue refinement of B-spline toolkit
*Create B-spline data structure in ACSYNT
*Integrate B-spline toolkit functionality into ACSYNT
*Knot removal techniques for data reduction on large models
*Bezier surface output from B-spline toolkit
*IGES output from B-spline toolkit
*Surface shape control by handles
*Test stereo-lithography via IGES-CATIA

Graphical User Interface Research and Development

*Spreadsheet input
*PHIGS+ rendering for member workstations (if available)
*Pilot vision diagram (eyeball view)
*Arbitrary viewpoint (i.e. weapon view)
*Postscript output for graphs and geometry
*Sized vs. as-drawn comparison
*Graphical output for weights (bar-charts)
*Graphical output for mision (improve mission data structure)

Analysis Research and Development

- *Cost analysis
- *Takeoff noise analysis
- *Propellers
- *Sonic boom
- *Vortex lattice incorporation
- *Stability

Integrated Research and Development

- *Integration of geometry and analysis
- *Harris wave drag
- *LAWGS output from Harris
- *Interactive execution of aerodynamics

Support of ACSYNT

- *Installation and test at all sites
- *Release generation
- *Training short course
- *Improvement of software standards (CASE systems)
- *Two meetings in 1991
- *Continue develoment of test case library
- *Updated list of technical references

ACSYNT INSTITUTE

R&D PLAN 1991

Geometric Modeling Research and Development (ACSYNT)

- Match tangents between components such as the nose and mid-section [VPI]

- Modify the Parent-Child relationship to include all components or add some type of grouped translation and rotation [VPI*]

- Airfoils
  - Supercritical and 4,5,6-Digit sections with twist [Ames*]
  - Generation and data entry

- Refine the Multi-Section wings - match cross-sections between adjoining sections [VPI*]

- Integrate B-Spline Module functionality into ACSYNT [VPI]

- Parametric Component Generation
  - Canopy and Propellers [VPI*]
  - Bombs & Missiles, Engine, Landing Gear, Boxes, Galleys [VPI]
  - Seats, Doors, Windows, Control Surfaces [VPI]

- Spine and cross-section component generation [VPI]

- Component library - contains data to automatically create commonly used components [VPI]

Geometric Modelling Research and Development (B-Spline Module)

- Add Interactive 2-D parametric filleting [VPI*]

- Obtain aircraft parameters from B-spline surface data [VPI*]

- Develop a B-spline surface skinning algorithm [Ames*]

- Knot removal techniques for data reduction [VPI*]

- Stereo Lithography compatible output [Ames]

- Investigate fairing and smoothing algorithms [VPI]

- Interactive surface shape control by handles [VPI]
- Compute and display volume distribution [VPI]
- Bezier surface output from B-Spline module [VPI]

Graphical User Interface Research and Development

- Spreadsheet input [VPI*]
- PHIGS+ rendering for available workstations [Ames &VPI*]
- Automatic zoom and center [VPI*]
- Allow the user to define the center of view rotation [VPI*]
- Pilot and arbitrary view (i.e. weapon view) [VPI*]
- Display and edit lighting/shading parameters in list format [VPI*]
- Postscript output for graphs and geometry [VPI]
- Graphical output for mission (improve mission data structure) [VPI]

Analysis Research and Development

- Cost Analysis [Ames*]
- Restructure Aerodynamics module [Ames]
- Takeoff noise analysis [Ames]
- Propellers [Ames]
- Vortex lattice incorporation [Ames]
- Stability [Ames]

Integrated Research and Development

- Integration of Geometry and analysis [VPI] & Ames]
    - Computer wetted surface areas using the Hermite geometry and use in the analysis code [Ames]

- Harris Wave Drag [VPI & Ames]
- LAWGS output from Harris [Ames]
- Interactive execution of Aerodynamics [Ames]

Support of ACSYNT

- Installation and test at all sites [VPI*]
- Release Generation [VPI & Ames*]
- Training Short Course [VPI & Ames*]
- Improvement of Software Standards (CASE systems) [VPI & Ames]
- 2 meetings in 1991
- Continue the development of test case library [VPI & Ames]
- Updated list of technical references [VPI &Ames]

Data and Methods Contributed by ACSYNT Members

- Contact MacAir about component library [VPI*]
- Contact Lockheed for rule Based Fuselage [VPI*]
- Contact Northrup for fighter weights and any other items offered at last meeting [VPI*]

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*Complete or demonstrate by 5/91

ACSYNT INSTITUTE

1990 DELIVERABLES

- User interface improvements
- B-spline intersection methods
- Parent Child component relationships
- Improved engine geometry
- Variable fusiform bodies
- Complete merging of CAD and Analysis
- B-spline toolkit
- Extensive testing
- IGES interfaces
- Carpet plotting capability
- Initial sonic boom module
- Integrated inlet geometry and analysis
- Complex wing geometry
- Volume and mass property calculations

ACSYNT INSTITUTE

1991 DELIVERABLES

- Automatic matching of X-sections across components
- Discontinuity/continuity choice in multipanel wings
- POSTSCRIPT output
- Data reduction using knot removal techniques
- Obtaining component parameters from surface description of aircraft components
- Spreadsheet input
- New user interface in the B-spline tool kit
- Curvature plots
- Preliminary work in B-spline skinning
- B-spline model modification using handles
- Robust method for calculating sectional areas for volume plots
- Better input method using templates for shading parameters